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no sign of nebulous background. The third was taken April 23, and it was exposed for $6^{h}\ 35^{m}$, and this also is altogether without nebulous background, although it shows 10,946 stars in the same square degree.*

The photographic plates used were extremely sensitive, so much so that seven hours' exposure on them would be equivalent to at least ten hours on the plates in use two years since. I think, therefore, that we may assume that there is no nebulous background to the star cluster H 3315 at all approaching that in the *Pleiades* in brilliance. This cluster appears to the unaided eye as a conspicuous white spot following the nebula about η *Argûs*, and it covers a space about equal to one square degree. It is in R.A. $11^{h}\ 2^{m}$, Decl. $58°\ 9'$ S. The *réseau* lines on the photograph enclose spaces 5 minutes of arc each way.

[Slide 10 shows this cluster as photographed here with the star camera, and slide 9 its relation in position to η *Argûs*. If No. 9 numbered corner be held as upper right-hand corner the top is north and the left the following side, and the cluster follows the nebula about one inch, and a little north.]

1894 *February* 2.

A Seconds Contact-Maker for Astronomical Clocks.

By H. C. Russell, B.A., F.R.S.

The difficulty in getting good seconds contacts from astronomical clocks, owing to irregularities due to errors in the spacing of the escape wheel and the faulty methods of contact used, has induced me on several occasions to try and get some attachment to the pendulum that would do the work. Invariably I have been unsuccessful in the search for a good working device, until in July last it occurred to me that if a wheel were attached to the pendulum rod it might be made to roll over a spring and press it down to contact without *any friction except that on the* axis of the wheel. The idea looked promising, and I had one made, which after several months' trial is good enough to publish, since it is likely to be useful to others.

The design is so simple that with the diagram herewith (Plate 7) little explanation is required.

First it will be seen that the contact is made through the medium of a very light wheel attached to the pendulum, which

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* It may be mentioned that a count of the stars in the same space (1°) in the negative taken with the portrait camera (slide No. 9) of this object, and exposed for eight hours, shows 1,355, or only one-tenth of the number shown on the negative taken with the star camera on 1893 April 12.

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at each swing rolls over a little bridge on the spring and depresses it to make contact. This wheel is the plain balance wheel taken out of a watch, and it therefore has pivots in which friction has been reduced to a minimum. It is also obvious from the arrangement of these parts that after the pendulum passes the centre the recoil of the spring by pressing against the retreating wheel gives a slight impulse to the pendulum, and so restores a part of the work done in depressing it.

The question of importance is, How much does such a contact reduce the arc of the pendulum? The minimum effect I have not yet determined, but I have found that the maximum effect—which is produced by using a current of six volts, or strong enough to occasionally fuse the platinums together, unless a considerable tension is put on the contact spring—does not reduce the arc of the pendulum any more than the old tilt-hammer contact did when working at its best. Such a current is, of course, quite unnecessary, and by reducing it the strength of the contact spring may be proportionately reduced, and with it the work the pendulum has to do, and the demand therefore made on the clock is far less than that required to work either the tilt-hammer contact or that in which two springs are pressed together by the clock escape-wheel, or another wheel on the same axis.

It is a convenience to have the contact-maker placed where it can be seen and cleaned, and especially such an arrangement as this, which can be used either as a make or a break circuit; for to make it a break circuit all that is necessary is to move the wire from one binding screw *o* to the other *o''*.

Turning now to the diagram, the attachment on the pendulum rod *h* is placed about fourteen inches above the top of the pendulum bob—it may be anywhere, but this is the most convenient place—*i* and *t* carry the (balance) wheel *f*; the other parts are attached to a piece of hard wood *a a a*, which in turn is screwed on to the back of the clock case *c c* by the screws *b b*. The bracket piece *d* is screwed on to *a*, and carries a binding screw *o'* and the spring *g*, which is attached to it by the screws *r* and *s*. Under these screws the spring is made thicker, so that it can be screwed in different positions on the rounded base on which it rests, and so adjust the tension of the spring *g*. Between the steel bar *v* on *g* and the screw *s*, *g* is filed away as much as possible, to make it easily bent down for contact. At the point where *g* rests upon *k* and *k'* it is coated with platinum, and both screws are tipped with the same metal. The bracket *m* carries the upper contact screw *k* and the binding screw *o''*, while *n* carries the lower contact screw *k'* and the binding screw *o*; *l l* are locking nuts to keep *k k'* in their places; *p* is the pendulum rod, shown at rest. The attachment *h* on the pendulum was made much lighter than it is shown in the diagram; the same remark applies to the spring *g*, which is made of bronze, 0·008 inch

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thick. In other respects the diagram shows the several parts of the size they were actually made.

Observatory, Sydney:
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P.S.—The necessary break in the circuit to leave out the 60th second is made by a wheel on the escape-wheel axis, which has only one tooth, and this tooth lifts a small tilt-hammer arrangement once a minute and breaks circuit for one second.

[*Note by the Editors.*—When the above paper was read to the meeting on 1894 March 9, it was remarked that similar devices had been used before. Messrs. T. Cooke & Sons, of York, have shown in a sketch (Plate 8) an arrangement of the kind made by them some years back. As it does not appear certain, however, that any account of such an arrangement has yet been published, the Council deemed it advisable to publish Mr. Russell's paper, together with Messrs. Cooke's sketch.]

Occultation of α Virginis observed at Dunsink, 1894 *March* 22.

By Professor Arthur A. Rambaut, M.A., Sc.D.

The occultation of α *Virginis*, which took place on the morning of Good Friday, was observed here by my assistant, Mr. Lyster, and myself. I used the 12-inch refractor, with a power of 300, and recorded the times of disappearance and reappearance electrically on the chronograph. Mr. Lyster was stationed at the 5-inch guiding telescope, attached to the "Roberts" photographic equatorial, carrying a power of 100, and noted the times by direct comparison with an Arnold clock in the dome. The error and rate of this clock were determined by comparing it with a chronometer which was also compared with the Dent sidereal clock.

At the time of disappearance we were enveloped in a dense fog, which completely obscured *Spica* and *Saturn* (which was in the neighbourhood) from the naked eye, but by the time the star was due to reappear the fog had almost entirely cleared away.

To me the star seemed to disappear instantaneously at $15^{\mathrm{h}}\ 31^{\mathrm{m}}\ 46^{\mathrm{s}}{\cdot}97$ local sidereal time. This was, of course, at the bright limb.

At emergence I put a note to the effect that "reappearance was not quite instantaneous, perhaps a tenth of a second before full brilliance was attained." The time noted as that of reappearance corresponds to the first gleam of light sufficient to attract my attention. This occurred at $16^{\mathrm{h}}\ 41^{\mathrm{m}}\ 24^{\mathrm{s}}{\cdot}91$ local sidereal time.

Mr. Lyster reports that both disappearance and reappearance seemed to him to occur instantaneously; the former at $15^{\mathrm{h}}\ 31^{\mathrm{m}}\ 45^{\mathrm{s}}{\cdot}9$, and the latter at $16^{\mathrm{h}}\ 41^{\mathrm{m}}\ 24^{\mathrm{s}}{\cdot}6\pm$, local sidereal time.

Dunsink Observatory, Co. Dublin:
1894 *March* 27.